

Work Order ID 151840

Tuesday, October 11, 2016 3:13:01 PM

151840

Page 1

Item ID: D350-748-243TRN

Accept

N900040100Setup Start ***NS1***

Revision ID:

Stop ***NS2***

Item Name: Crosstube Installation, High Aft

Start Date: 10/11/2016 Start Qty: 1.00

1

Cust Item ID:

Required Date: 10/18/2016 Req'd Qty: 1.00

1

Customer:

Reference:

Approvals: Process Plan:

DAS
21
9-89

Date: OCT 11 2016 Tooling:

Date:

Run Start ***NR1***

QC:

Date: SPC (Y/N):

Date:

Stop ***NR2***Sequence ID/
Work Center IDOperation
DescriptionSet Up/
Run Hours

Tool ID

Tool #

Plan
CodeAccept
QtyReject
QtyReject
NumberInsp.
Stamp

Draw Nbr

Revision Nbr

D350-748-243

A

100

0.00

100

Mori Seiki

MORI SEIKI CNC LATHE LARGE

Memo

0.30

Mori Seiki CNC Lathe Large

1-Cut tube on chop saw, leave extra mat'l for facing and install plugs 350-241 on both ends.

2-Face both sides of tube.

3- Turn program 02000 section on both side as per folio FB468.

4- Turn program 03000 section on both side as per folio FB468.

5- Blend transsition lines only with belt sander 60 grit

Folio rev: AKDwg rev: A

110

QC2- Inspect parts off machine FAI/FAIB

0.00

110

QC

Memo

0.00

Quality Control

1 0 VHF

16/10/12

1 0 VHF

DQA: _____ Date: _____

WORK ORDER NON-CONFORMANCE / UPDATE



QA Closed: _____ Date: _____

Work Order update only ☐

Work Order: _____ Part No. _____ NCR No. _____	DISPOSITION Rework ☐ Scrap ☐ Use-as-is ☐ Suspected Unapproved ☐	AGAINST DEPARTMENT/PROCESS Skid-tube ☐ Machining ☐ Thermoforming ☐ Large Fab ☐ Cross tube ☐ Small Fab ☐ Finishing ☐ Composite ☐ Water Jet ☐ Prod. Eng. Coord. ☐ Rec/Store/Packaging ☐ Supplier ☐ Engineering ☐ Quality ☐ Other ☐			
Date :	Step #:	QTY Effective :		MRB (QSI042) Approval	
Description Work Order Deviation		Disposition			
				Completed By	
				Lead hand / Supervisor Approval Verification	
				QC / QA Coordinator Approval	
Root Cause Environment ☐ Design ☐ Doc/Data ☐ Equip/Tooling ☐ Handling/Pre ☐ Material ☐ Internal Transport ☐ Tribal Knowledge ☐ LOA ☐ Substation ☐ Past Expiry Date ☐ Misidentified ☐ No Re-verification ☐ Operator ☐ Offset/Setup ☐ Supplier ☐ Training ☐ Use for Testing ☐ Poor Information ☐ Rushing ☐ Product Improvement ☐ Process Improvement ☐ Manufacturing Process ☐ Past Due ☐		FAULT CATEGORY Pressure/Forced ☐ Bending ☐ Centre Not Concentric ☐ Cracks ☐ Crimp/Kink/Ripple/Wave ☐ Cuffs ☐ Crushing ☐ Heat Treat ☐ Wave/Twist in Tube ☐ Marks/Chatter ☐ Temperature/Cure ☐ Set-up ☐ BOM/Route ☐ Broken/Damage/Defect ☐ Inspection Incomplete/Unqualified ☐ Contamination ☐ Countersink ☐ Cut Too Short ☐ Instructions Incomplete/Unclear ☐ Drill Holes ☐ Power Loss/Surge ☐ Folio/Program ☐ Grain ☐ Weld ☐ Wrong Stock Pulled ☐ Out of Sequence ☐ Off-set ☐ Mislabeled ☐ Fit/Function ☐ Misaligned/off center ☐ Positioned Wrong ☐ Outside Dimensions ☐ Over/Under tolerance ☐ Part Incorrect ☐ Part Lost/Missing ☐ Part Moved ☐ Drawing ☐ Finish ☐ Misread ☐ Turning Sequence ☐			
OTHER : ☐					

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Page 2

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Start Date: 10/11/2016 Start Qty: 1.00 ***1***

Cust Item ID:

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Customer:

Reference:

Approvals: Process Plan:

Date:

Tooling:

Date:

Run Start ***NR1***

QC:

Date:

SPC (Y/N):

Date:

Stop ***NR2***Sequence ID/
Work Center IDOperation
DescriptionSet Up/
Run Hours

Tool ID

Tool #

Plan
CodeAccept
QtyReject
QtyReject
NumberInsp.
Stamp

120

0.00

120

Mori Seiki

Mori Seiki CNC Lathe Large

MORI SEIKI CNC LATHE LARGE

Memo

0.49

1- Turn program 04000 section on both side as per folio FB468.

2- Turn program 05000 section on both side as per folio FB468.

3- Blend transsition lines only with belt sander 60 grit

4-Scribe part # as per Dwg D350-748-243

Folio rev: 44Dwg rev: 6

130

0.00

130

QC

Quality Control

QC2- Inspect parts off machine FAI/FAIB

Memo

0.00

PERFORME ULTRASONIC MEASURMENT

1

0

16/10/13

DQA: _____ Date: _____

WORK ORDER NON-CONFORMANCE / UPDATE



QA Closed: _____ Date: _____

Work Order update only ☐

Work Order: _____ Part No. _____ NCR No. _____	DISPOSITION Rework ☐ Scrap ☐ Use-as-is ☐ Suspected Unapproved ☐	AGAINST DEPARTMENT/PROCESS Skid-tube ☐ Machining ☐ Thermoforming ☐ Large Fab ☐ Cross tube ☐ Small Fab ☐ Finishing ☐ Composite ☐ Water Jet ☐ Prod. Eng. Coord. ☐ Rec/Store/Packaging ☐ Supplier ☐ Engineering ☐ Quality ☐ Other ☐			
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		OTHER : ☐			

Work Order ID 151840

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Item ID: D350-748-243TRN**Accept*****N900040100*****Setup Start *NS1*****Revision ID:****Stop *NS2*****Item Name:** Crosstube Installation, High Aft**Start Date:** 10/11/2016 **Start Qty:** 1.00 ***1*****Cust Item ID:****Required Date:** 10/18/2016 **Req'd Qty:** 1.00 ***1*****Customer:****Reference:****Approvals:** **Process Plan:** **Date:****Tooling:** **Date:****Run Start *NR1*****QC:** **Date:****SPC (Y/N):** **Date:****Stop *NR2*****Sequence ID/
Work Center ID****Operation
Description****Set Up/
Run Hours****Tool ID Tool # Plan Code Accept Qty Reject Qty Reject Number Insp. Stamp**

140

QC8- Inspect parts - second check

0.00

140

QC

Memo

0.00

Quality Control

DAS
47
9-89
16-10-17

150

Large Fab

0.00

150

Crosstubes

Memo

0.20

Crosstubes

1-Grind machining marks

DP7 16-10-24

190

Packaging

0.00

190

Packaging

Memo

0.00

Packaging

Identify and stock in kanban rack
Location: LG 14

DP2 16-10-24

DQA: _____ Date: _____

WORK ORDER NON-CONFORMANCE / UPDATE



QA Closed: _____ Date: _____

Work Order update only ☐

Work Order: _____ Part No. _____ NCR No. _____		DISPOSITION Rework ☐ Scrap ☐ Use-as-is ☐ Suspected Unapproved ☐		AGAINST DEPARTMENT/PROCESS Skid-tube ☐ Machining ☐ Thermoforming ☐ Large Fab ☐ Cross tube ☐ Small Fab ☐ Finishing ☐ Composite ☐ Water Jet ☐ Prod. Eng. Coord. ☐ Rec/Store/Packaging ☐ Supplier ☐ Engineering ☐ Quality ☐ Other ☐																																																													
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Environment ☐	No Re-verification ☐	Pressure/Forced ☐	Temperature/Cure ☐	Power Loss/Surge ☐	Positioned Wrong ☐	Design ☐	Operator ☐	Bending ☐	Set-up ☐	Folio/Program ☐	Outside Dimensions ☐	Doc/Data ☐	Offset/Setup ☐	Centre Not Concentric ☐	BOM/Route ☐	Grain ☐	Over/Under tolerance ☐	Equip/Tooling ☐	Supplier ☐	Cracks ☐	Broken/Damage/Defect ☐	Weld ☐	Part Incorrect ☐	Handling/Pre ☐	Training ☐	Crimp/Kink/Ripple/Wave ☐	Inspection Incomplete/Unqualified ☐	Wrong Stock Pulled ☐	Part Lost/Missing ☐	Material ☐	Use for Testing ☐	Cuffs ☐	Contamination ☐	Out of Sequence ☐	Part Moved ☐	Internal Transport ☐	Poor Information ☐	Crushing ☐	Countersink ☐	Off-set ☐	Drawing ☐	Tribal Knowledge ☐	Rushing ☐	Heat Treat ☐	Cut Too Short ☐	Mislabeled ☐	Finish ☐	LOA ☐	Product Improvement ☐	Wave/Twist in Tube ☐	Instructions Incomplete/Unclear ☐	Fit/Function ☐	Misread ☐	Substation ☐	Process Improvement ☐	Marks/Chatter ☐	Drill Holes ☐	Misaligned/off center ☐	Turning Sequence ☐	Past Expiry Date ☐	Manufacturing Process ☐	OTHER :			
Misidentified ☐	Past Due ☐																																																																

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Page 4

Item ID: D350-748-243TRN**Accept*****N900040100*****Setup Start *NS1*****Revision ID:****Stop *NS2*****Item Name:** Crosstube Installation, High Aft**Start Date:** 10/11/2016 **Start Qty:** 1.00 ***1*****Cust Item ID:****Required Date:** 10/18/2016 **Req'd Qty:** 1.00 ***1*****Customer:****Reference:****Approvals:** **Process Plan:** **Date:****Tooling:** **Date:****Run Start *NR1*****QC:** **Date:****SPC (Y/N):** **Date:****Stop *NR2*****Sequence ID/
Work Center ID****Operation
Description****Set Up/
Run Hours****Tool ID Tool # Plan Accept Reject Reject Insp.
Code Qty Qty Number Stamp**

200

QC21- Final Inspection - Work Order Release

0.00

200

QC

Memo

0.20

Quality Control

16/10/24

16-10-24

DQA: _____ Date: _____

WORK ORDER NON-CONFORMANCE / UPDATE



QA Closed: _____ Date: _____

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Work Order: _____ Part No. _____ NCR No. _____	DISPOSITION Rework ☐ Scrap ☐ Use-as-is ☐ Suspected Unapproved ☐	AGAINST DEPARTMENT/PROCESS Skid-tube ☐ Machining ☐ Thermoforming ☐ Large Fab ☐ Cross tube ☐ Small Fab ☐ Finishing ☐ Composite ☐ Water Jet ☐ Prod. Eng. Coord. ☐ Rec/Store/Packaging ☐ Supplier ☐ Engineering ☐ Quality ☐ Other ☐			
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OTHER : ☐					

Picklist Print

Tuesday, October 11, 2016 3:13:07 PM

Page 1
T

Work Order ID: 151840

151840

Parent Item: D350-748-243TRN

D350-748-243TRN

Parent Item Name: Crosstube Installation, High Aft

Start Date: 10/11/2016

Required Date: 10/18/2016

Start Qty: 1.00

Required Qty: 1.00

Comments: IPP Rev: PRELIM New Issue LL 12.05.08

Component Item ID/ Item Name	Replacement Item ID	Mfg/ Purch	Bin Item	Primary Location	Last Location	Route Seq ID	Unit of Measure	Qty on Hand	Qty per Kit	Total Qty	Qty Issued	Date Issued	Status
D6021-125		Manufactured	No				Each	37.0000		1			

D6021-125

Crosstube Material - 17-4Ph SS

**

Location	Loc Qty	Loc Code
HAL	21	
127271	21	
LG	16	
127272	16	

1

16/10/16

DQA: _____ Date: _____



WORK ORDER NON-CONFORMANCE / UPDATE

QA Closed: _____ Date: _____

Work Order update only ☐

Work Order: _____ Part No. _____ NCR No. _____	DISPOSITION Rework ☐ Scrap ☐ Use-as-is ☐ Suspected Unapproved ☐	AGAINST DEPARTMENT/PROCESS Skid-tube ☐ Machining ☐ Thermoforming ☐ Large Fab ☐ Cross tube ☐ Small Fab ☐ Finishing ☐ Composite ☐ Water Jet ☐ Prod. Eng. Coord. ☐ Rec/Store/Packaging ☐ Supplier ☐ Engineering ☐ Quality ☐ Other ☐			
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OTHER : _____					

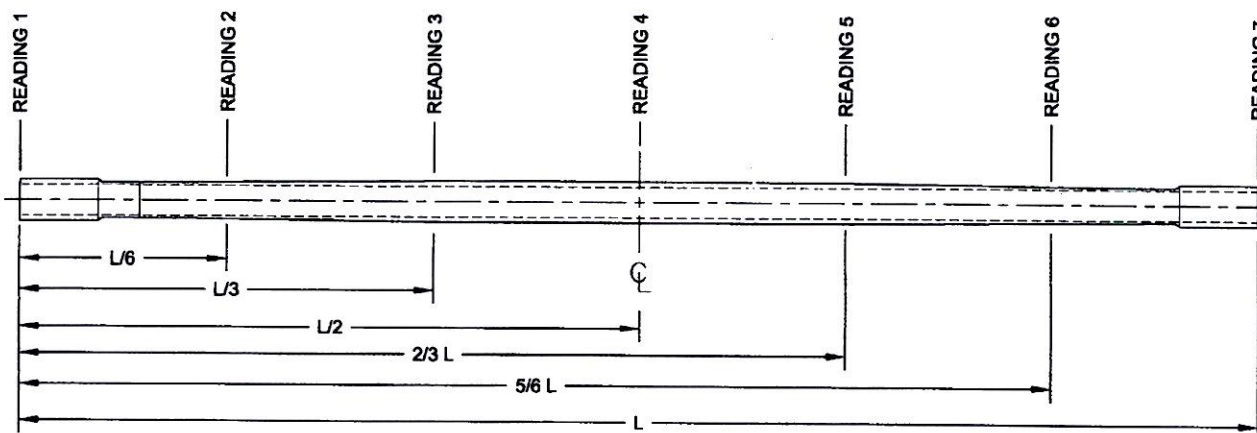
DART AEROSPACE LTD	Work Order:	151840
Description: Crosstube Assembly (AS350/355 High Aft SS)	Part Number:	D350-748-243
Inspection Dwg: D350-748-243 Rev: A		Page 1 of 2

FIRST ARTICLE INSPECTION CHECKLIST

	Inspection Sheet Drawing Dimension	Tolerance	Actual Dimension	Accept	Reject	Method of Inspection	Comments
SIDE A	2.240	+/-0.005	2.243	✓		↑	
	2.180	+0.005/-0.000	2.183	✓		↑	
	2.180	+0.005/-0.000	2.183	✓		↑	
	2.208	+0.005/-0.000	2.211	✓		↑	
	2.234	+0.005/-0.000	2.236	✓		↑	
	2.253	+0.005/-0.000	2.255	✓		↑	
	2.272	+0.005/-0.000	2.277	✓		↑	
	2.299	+0.005/-0.000	2.302	✓		Vernier	
	0.063	+/-0.010	0.063	✓		↑	
	5.25	+/-0.060	5.25			↑	
	R0.063	+/-0.010	R0.063	✓		↑	
	R0.50	+/-0.030	R0.50	✓		Vernier	
SIDE B	2.240	+/-0.005	2.245	✓		↑	
	2.180	+0.005/-0.000	2.183	✓		↑	
	2.180	+0.005/-0.000	2.181	✓		↑	
	2.208	+0.005/-0.000	2.210	✓		↑	
	2.234	+0.005/-0.000	2.236	✓		↑	
	2.253	+0.005/-0.000	2.255	✓		↑	
	2.272	+0.005/-0.000	2.277	✓		↑	
	2.299	+0.005/-0.000	2.301	✓		Vernier	
	0.063	+/-0.010	0.063	✓			
	5.25	+/-0.060					
	R0.063	+/-0.010	R0.063	✓			
	R0.50	+/-0.030	R.50	✓		Vernier	
	124.70	+/-0.060	124.70	✓		Tape	

DART AEROSPACE LTD	Work Order:	
Description: Crosstube Assembly (AS350/355 High Aft SS)	Part Number:	D350-748-243
Inspection Dwg: D350-748-243 Rev: A		Page 2 of 2

WALL THICKNESS MEASUREMENT



Location	WALL THICKNESS MEASUREMENT (IN)				Deviation Δw (max-min)	TOLERANCE
	w1	w2	w3	w4		
READING 1 L= 0"						0.030"
READING 2 L=						
READING 3 L=						
READING 4 L=						
READING 5 L=						
READING 6 L=						
READING 7 L=						

Calibration Result

Actual Block Thickness: _____

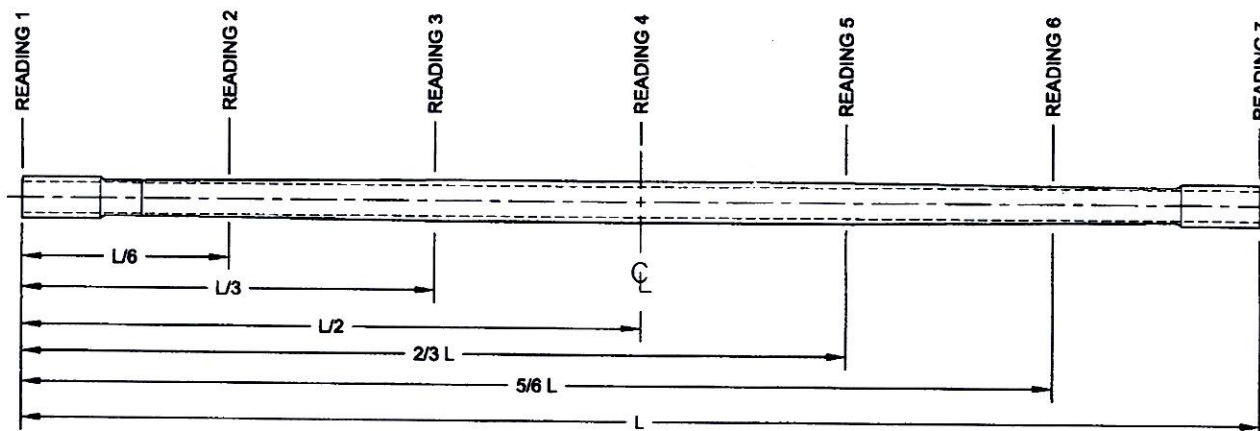
Sitescan 250 Measured Thickness: _____

Measured by:	Audited by:	Preliminary Approval:
Date:	Date:	Date:

Rev	Date	Change	Revised by	Approved
A	15.09.09	New Issue (P/O D350-748-203)	KJ	

DART AEROSPACE LTD		Work Order:	151840
Description: Crosstube Assembly (AS350/355 High Aft SS)		Part Number:	D350-748-243
Inspection Dwg: D350-748-243 Rev: A		Page 2 of 2	

WALL THICKNESS MEASUREMENT



Location	WALL THICKNESS MEASUREMENT (IN)				Deviation Δw (max-min)	TOLERANCE
	w1	w2	w3	w4		
READING 1 L= 0"	133	132	126	123	0.010	0.030"
READING 2 L=	119	119	115	113	0.006	
READING 3 L=	156	158	154	153	0.004	
READING 4 L=	157	154	155	156	0.003	
READING 5 L=	152	153	162	158	0.010	
READING 6 L=	115	117	119	118	0.004	
READING 7 L=	127	127	127	128	0.001	

Calibration Result

Actual Block Thickness: 100-450

Sitescan 250 Measured Thickness: 100-450

Measured by:	VH
Date:	16/10/13

Audited by:	JW
Date:	16-10-17

Preliminary Approval:	
Date:	

Rev	Date	Change	Revised by	Approved
A	15.09.09	New Issue (P/O D350-748-203)	KJ	

Item	Qty -243	Part Number	Description
1	X	D350-748-243	CROSSTUBE ASSEMBLY (AS 350/355 HI AFT)
2	1	D6021-125	CROSSTUBE
3	2	D3502-1	SUPPORT
4	2	D5123-7	CLAMP CUSHION
5	1	AETC-1032	INSERT
6	2	MS21920-20 OR MS21920-21/-22	CLAMP (PER DART SPEC. M-MS21920-20/-21/-22)
7	1	NAS1149C0363R	WASHER (OR AN960C10)
8	1	NAS1635-3-8	SCREW (OR MS51958-63)
9	AVR	PROSEAL 890 B-2	SEALANT, AMS-S-8802 CLASS B-2

GENERAL NOTES:

- MATERIAL: MANUFACTURED FROM D6021-125
FINISHED LENGTH AFTER TURNING = 124.70±0.06 (AFTER BENDING/TRIMMING = 122.70 REF)
- FINISH: PRIME INSIDE AND OUTSIDE PER DART QSI 005 4.2
PAINT OUTSIDE PER DART QSI 005 4.2
- TOLERANCE: PER DART QSI 018 UNLESS OTHERWISE NOTED.
WALL THICKNESS ECCENTRICITY PER DART QSI 038 7.2
MIN. ALLOWABLE WALL IS -0.020 FROM NOMINAL
- UNITS: INCHES UNLESS OTHERWISE NOTED.
- BREAK SHARP EDGES: 0.005 TO 0.010 MAX.
- IDENTIFICATION: DART PART NUMBER "D350-748-243" AND BATCH NUMBER ON INSIDE OF CUFF
PER DART QSI 044 6.4 (VIBRATING STYLUS)
- WEIGHT: 29.85 lbs
- PART IS SYMMETRIC ABOUT CENTERLINE, EXCEPT FOR Ø0.290 HOLE.
- EXTREME CARE MUST BE TAKEN TO PROTECT THE OUTSIDE SURFACE OF THE TUBE. THE OUTSIDE SURFACE MUST BE SMOOTH AND FREE FROM SURFACE DEFECTS SUCH AS SCRATCHES, NICKS, OR DENTS. DEFECTS UP TO 0.005" MAY BE BLENDED OUT LONGITUDINALLY. CIRCUMFERENTIAL GRIND MARKS ARE UNACCEPTABLE. WHEN DRILLING HOLES EXTREME CARE MUST BE TAKEN AND CAREFUL DEBURRING PERFORMED TO ENSURE A CLEAN HOLE WITH NO CRACKING/CHIPPING/GROOVES.

TURNING

- BLEND OUT ALL EDGES FROM MACHINING LONGITUDINALLY, TRANSITION SHOULD BE SMOOTH. NOTE: ALL HOLES ARE DRILLED AFTER BENDING.

BENDING

- BEND PROGRESSIVELY WITH A MINIMUM OF 7 PASSES PER SIDE. MAXIMUM TUBE FLATTENING DUE TO BENDING IS 6% BASED ON O.D. ON TOP HALF OF BEND, AND 8% ON BOTTOM HALF OF BEND.
- MAX AMPLITUDE OF RIPPLING ALONG BENT PORTION OF THE TUBE IS 0.030 (ZN A1-3)
- MAX TWIST: WITH XTUBE LAYED FLAT ON SURFACE, THE DIFFERENCE BETWEEN CUFF HEIGHTS FROM THE SURFACE MAY BE NO LARGER THAN 0.38 (ZN C1-3).

ASSEMBLY

- TO INSTALL D3502-1 SUPPORT: ABRASE MATING SURFACE OF SUPPORT AND CROSSTUBE WITH 180-GRIT SANDPAPER AND REMOVE RESIDUE WITH MEK (OR EQUIVALENT). APPLY A 0.02" TO 0.05" THICK LAYER OF PROSEAL 890 CLASS B-2 (OR AMS-S-8802 CLASS B-2) SEALANT TO MATING SURFACE OF SUPPORT.
- TORQUE CLAMPS 80 TO 80 IN-LB. ENSURE AT LEAST 1.5 THREADS SHOWING IN SAFETY AND THAT NUT HAS NOT BOTTOMED-OUT AFTER TORQUING. PRIOR TO PACKAGING, RE-CHECK TORQUE ON CLAMPS AFTER PROSEAL 890 SEALANT HAS CURED FOR 72 HOURS.

SHOP COPY
RETURN TO
ENGINEERING
UNCONTROLLED COPY
SUBJECT TO AMENDMENT
WITHOUT NOTICE
WORK ORDER

NO. 151840 MJS
10-10-01

DEO ATTACHED

RELEASED

2015 MAR 18

RELEASED

2015 MAR 18

UNDER REVIEW

15/14/15 CK
LFF 15/14/15

A	NEW ISSUE	CP	15.01.21
REV.	DESCRIPTION	BY	DATE
DESIGN			
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APPROVED			
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DATE	15.01.21		

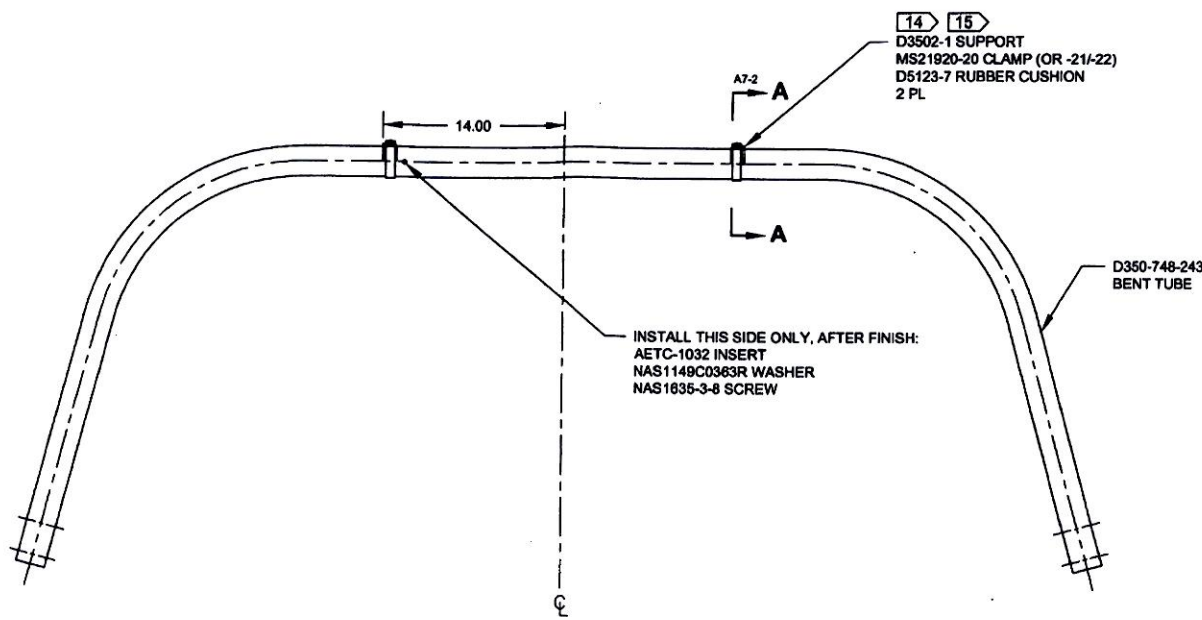
DART AEROSPACE LTD
HAWKESBURY, ONTARIO, CANADA

DRAWING NO. D350-748-243
REV. A
SHEET 1 OF 4

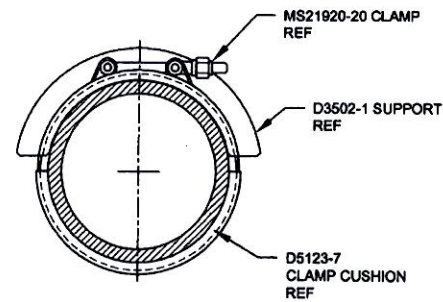
TITLE CROSSTUBE (AS 350/355 HI AFT)
SCALE NTS

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**D350-748-243
ASSEMBLY DETAIL**



SECTION A-A D4-2
SCALE 6X

DEO ATTACHED

UNDER REVIEW

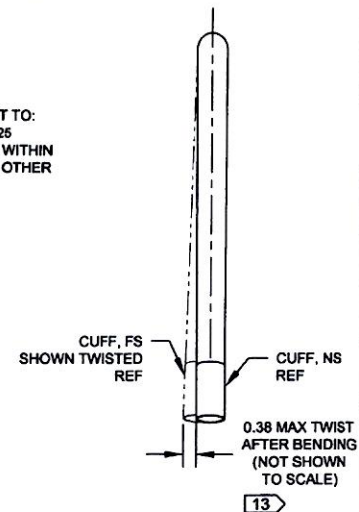
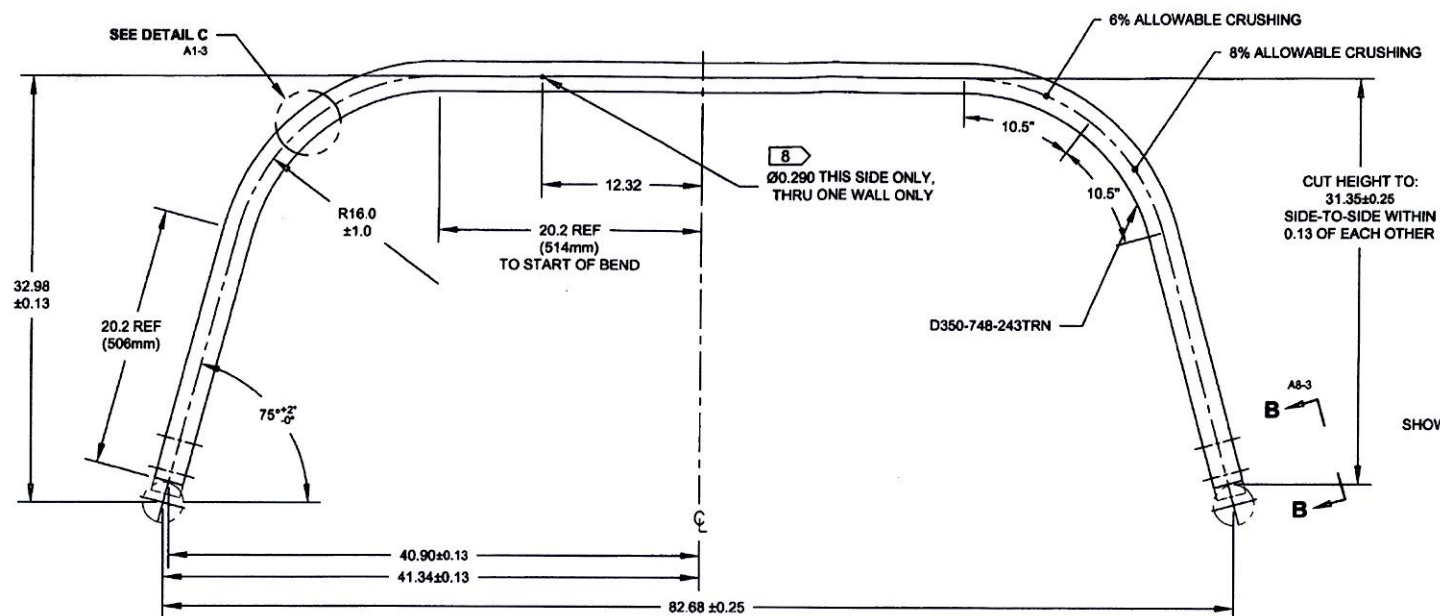
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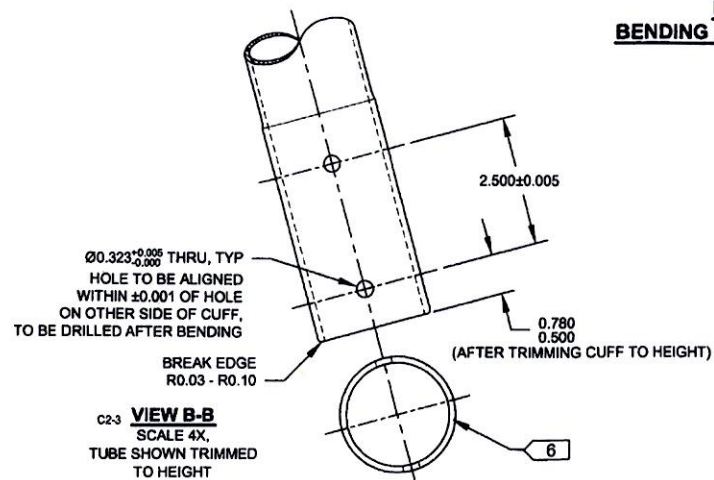
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DESIGN	90	DART AEROSPACE LTD	
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CHECKED	A.P.	DRAWING NO.	REV. A
MFG. APPR.	2/4	D350-748-243	SHEET 2 OF 4
APPROVED	3/4	TITLE	SCALE
DE APPR.	3/4	CROSSTUBE (AS 350/365 HI AFT)	NTS
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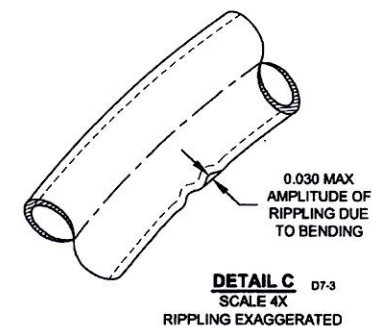
D350-748-243
BENDING AND DRILLING DETAIL 11



DEO ATTACHED
RELEASED
2015 MAR 18

UNDER REVIEW

15/11/12



DESIGN	99	DART AEROSPACE LTD	
DRAWN	99	HAWKESBURY, ONTARIO, CANADA	
CHECKED	A.P.	DRAWING NO.	REV. A
MFG. APPR.	<i>[Signature]</i>	D350-748-243	SHEET 3 OF 4
APPROVED	<i>[Signature]</i>	TITLE	SCALE
DE APPR.	<i>[Signature]</i>	CROSSTUBE (AS 350/355 HI AFT)	NTS
DATE	15.01.21	COPYRIGHT © 2015 BY DART AEROSPACE LTD	
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DRAWING NO. D350-748-243	TITLE CROSSTUBE	REV. A	DART AEROSPACE LTD ENGINEERING ORDER		D.E.O. NO. D350-748-243-A-1	SHEET NO. SHEET 1 OF 1	SCALE NTS
DRAWN <i>qp</i>	CHECKED <i>ASS</i>	MFG. APPR. <i>[Signature]</i>	APPROVED <i>[Signature]</i>		DE APPR. <i>[Signature]</i>		
DATE 15.11.18	DATE 15.11.18	DATE 16.02.19	DATE FEB 19 2016		DATE 2016.02.19		

AMEND NOTE 2 (SHEET 1) AS FOLLOWS:

- 2) FINISH: PREPARE SURFACE PER DART QSI 005 4.1.4
 PRIME INSIDE AND OUTSIDE PER DART QSI 005 4.2
 PAINT OUTSIDE PER DART QSI 005 4.2
 OR
 POWDER COAT WHITE (4.3.5.2) PER DART QSI 005 4.3

RELEASED
 2016-02-26
 EN 16-534 *[Signature]*

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